Example of Computing Expected Value and Risk Adjusted Value for Charges

The expected value is the average charge that would result if the hospital's mix of patients by severity level had been treated at the average charge in a reference normative database. For example, the reference database used could be all hospitals in a state. The computation presented is for an individual APR-.DRG. The computation could be expanded to include multiple APR-DRGs or any other subset of data by simply expanding the summations.

Consider the following example for an individual APR-DRG:

(1) Severity Level	(2) Hospital Count	(3) Hospital Avg. Chg.	(4) Reference Count	(5) Reference Avg. Chg.
1	10	$1,000	4,000	$1,200
2	20	$2,000	3,000	$2,500
3	40	$4,000	2,000	$5,000
4	30	$8,000	1,000	$10,000
APR-DRG Total	**100**	**$4,500**	**10,000**	**$3,230**

For the APR-DRG, the average charge in the hospital is $4,500 which is the sum of the product of columns (2) and (3) divided by the total number of patients (i.e., 100). For the example APR-DRG, the average charge in the reference data is $3,230 which is the sum of the product of column (4) and (5) divided by the total number of patients (i.e., 10,000). Thus, without severity adjustment, it appears that the hospital has an average charge in this APR-DRG that is $1,270 *higher* than in the reference hospitals. The severity adjusted expected average charge for the hospital can be computed as the product of column (2) (i.e., the hospital's casemix) and column (5) (i.e., the average charge by severity level in the reference hospitals) divided by the total number of patients in the hospital(i.e., 100).

(1) Severity Level	(2) Hospital Count		(5) Reference Avg. Chg.		(6) Expected TotChg.
1	10	x	$1,200	=	$ 12,000
2	20	x	$2,500	=	$ 50,000
3	40	x	$5,000	=	$ 200,000
4	30	x	$10,000	=	$ 300,000
APR-DRG Total	**100**				**$ 562,000**

The severity adjusted expected average charge for this hospital is $5,620 (i.e., $562,000/ l00). Thus, after severity adjustment, the hospital has an average charge that is $1,120 (i.e., $5,620 - $4,500) or 19.9 percent *lower* than would be expected based on its mix of patients. It is not meaningful to compare expected values across hospitals. Thus, if one hospital has a higher expected value than another hospital, no conclusion can be made

regarding the relative performance of the two hospitals. In order directly compare the performance of two hospitals a risk adjusted value can be computed. The risk adjusted value is computed as follows:

$$\text{Risk Adjusted Value} = \frac{\text{Hospital Actual Value}}{\text{Hospital Expected Value}} \times \text{Reference Actual Value}$$

In the above example the risk adjusted value would be

$$\text{Risk adjusted value} = \frac{4{,}500}{5{,}620} \times 3{,}230 = 2{,}586$$

Thus, after severity adjustment, the hospital has a risk adjusted average charge that is $644 (i.e., 3,230-2,586) or 19.9 percent lower than the average charge in the reference database. The expected value is relative to the hospital's actual value while the risk adjusted value is relative to actual value in the reference database. The risk adjusted value can be compared across hospitals. Thus, if one hospital has a risk adjusted average charge of $5,000 and another hospital has a risk adjusted average charge of $4,000, then the two risk adjusted amounts can be directly compared. Thus, the hospital with a risk adjusted charge of $5,000 has a risk adjusted average charge that is 25 percent higher than the hospital with the risk adjusted average charge of $4,000.

The same computations of expected values and risk adjusted value can be performed for any measure of interest. For binary variables such as mortality, the percent died in each APR-DRG would be used instead of the average value.